

# "Embracing the Digital Frontier: An Exploration of Readiness and Challenges in Educational Technology Implementation by Student Teachers in Lombok, Indonesia"

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## Abstract

This importance of this study is to understand more about readiness and challenges in educational technology so that all university students, lecturers or stakeholders can deal with digitalization era in term of education precisely especially in rural area such as Lombok, Indonesia. This study therefore investigated student teachers in the Faculty of Education at the Islamic University of Mataram during their seventh semester after they experienced teaching training practices program. To accomplish the study's goals, the researcher utilised a mixed-method strategy to gather data. The researcher conducted a questionnaire survey to evaluate the level of readiness and perspectives regarding the utilisation of technology. In addition, the researcher conducted interview sessions with the university's faculty heads to obtain further information. The researcher employed SPSS software to evaluate the quantitative data, whereas the qualitative data were encoded using NVIVO version 14 to find patterns and sub-patterns, facilitating the development of manual coding. The obtained data unveiled multiple elements that impacted the participants' use of technology. The variables can be classified into the following categories: 1) necessity, 2) self-emotion, 3) active user, 4) accessibility, and 5) digital service. The study's findings revealed a connection between the above factors and digital literacy, which is linked to instructional technology. Related to student teachers survey, it is found that they had moderate manifestation of readiness (3.8) and perspectives (3.7) on using technology. The stakeholders also have participated in this process to optimise the utilisation of technology for educational objectives. Thus it is found that networking issue, accessibility, difficulties in utilizing facilitation, and lack of motivation to prepare materials prior to class were the issue shared based on his educational activity experience in this faculty. Hence, it may be inferred that this university fulfils the requirements for education in the 21st century so the further research intends to explore the beneficial of enhancing technology skill for student teachers in their teaching training practices program.

**Keywords:** Implementation of Technology, Student Teachers, Digital Literacy, 21<sup>st</sup> Century Education

### **Introduction**

In order to meet the requirements of the modern era, a 21st-century education requires the improvement of students' abilities. Mastery of information technology and media is essential for pupils to excel in 21st-century education. Therefore, it is essential for educators to possess the necessary tools and knowledge to enhance these essential abilities, thereby enabling students to attain competence and mastery. In Indonesia, the incorporation of technology into the everyday educational routine is widespread, as pupils extensively utilise technology within the classroom. According to Machmud (2021), the Head of ICT Centre for Education at the Indonesian Ministry of Education stated that a mere 40% of Indonesian teachers had the necessary preparedness and competences to effectively incorporate technology into the learning process.

Hence, it is crucial to thoroughly investigate the integration of educational technology in Indonesian universities, particularly the University of Lombok. The importance of teachers adapting to the changing educational environment and offering students digital learning resources has led to the recognition of digital competencies among teachers as a vital aspect of effective teaching. This is particularly significant when faced with challenges arising from student circumstances in the classroom (Rusydiyah et al., 2020). This research aims to investigate the preparedness and obstacles related to the implementation of technology, as perceived by student teachers and faculty leaders. By doing so, it seeks to deepen our comprehension of the teaching and learning methods in 21st-century education.

This study has two main objectives

1. The aim is to assess and compare the preparedness and perspectives of student instructors from various programmes in incorporating educational technology into their teaching and learning methods.

The objective is to examine the difficulties and obstacles that faculty leaders have when incorporating educational technology into their teaching and learning methods.

It is crucial to recognise that comprehending the preparedness and obstacles to technology deployment is clarified by considering the viewpoints of students, supplemented by input from faculty leaders. This study focuses on university students who have previous experience in using technology for teaching and learning purposes. The study also includes information gathered from interviews with faculty leaders. The study utilised questionnaire surveys to get data from university students and interview sessions to collect insights from faculty leaders. The outcomes of the study reveal the perspectives of both groups on the integration of technology in their educational experiences at the university.

### **Literature Review**

According to Spencer (2015), educational technology consists of two interconnected subsets: technology in education and technology of education. The former, generally referred to as the hardware method, is widely recognised as audio-visual aids or instructional material. Sarigöz's (2019) study on the implementation of digital technology in education demonstrated its beneficial effects, including increased knowledge acquisition, experiential learning opportunities, heightened awareness, improved classroom engagement, a more enjoyable learning environment, enhanced academic achievement and motivation, improved comprehension, stimulated research and study, facilitated communication and relationships,

fostered creativity and higher-order thinking skills, reduced forgetfulness, alleviated lecture monotony, and overall increased awareness. Hence, it is clear that educational technology plays a crucial role, particularly in fulfilling the requirements of 21st-century education.

Rambe (2016) identified a discrepancy in viewpoints regarding the incorporation of technology into university curricula. Insufficient evidence was discovered about the successful implementation of affordable technology for educational reform in South African universities. Cabaleiro-Cerviño and Vera (2020) highlighted the crucial significance of educational technology in facilitating profound transformations within the classroom. As a result, teacher preparation programmes in universities have the goal of providing teacher candidates with the necessary abilities to effectively incorporate technology into their teaching and learning experiences (Francom & Moon, 2018). Tolulope et al (2015) emphasised the profound influence of technology in higher education, fundamentally changing the way teaching and learning are conducted. Essentially, the use of educational technology in higher education is closely connected to the training of teachers, as educators are accountable for effectively incorporating technology into the process of teaching and learning.

Indonesia has 28 universities that provide educational technology as a subject, and in certain universities, it is recognised as a separate field within their faculties. During the previous four years, over 400 universities in Indonesia have prioritised the benefits of mobile learning technologies, expecting a swift change and a rise in student enrollment with low financial commitments (Ariff, 2019). Retnawati (2019) raised apprehensions over a prospective dearth of proficient labourers in Indonesia by 2030. To address this issue, she advocated for the use of online education, which would be aided by enhanced internet penetration and infrastructure. The goal of digitising educational technology is to utilise a range of learning resources, allowing for adaptable and easily accessible learning. Hence, the efficacy of educational technology in Indonesia is significantly contingent upon the ubiquity of internet connectivity and energy throughout all provinces. This aligns with the government's ambition to foster future leaders who possess the ability to compete on a global scale, while also emphasising the cultivation of character.

Hasanah et al (2021) discovered that instructors at state Islamic colleges in Lampung, Indonesia lack the necessary preparedness to effectively utilise digital technology for Islamic learning. The lack of proficiency in creating digital-based teaching materials and strategies was identified as the cause for this insufficiency. In addition, their research uncovered that pupils had an average readiness score of 3.63 in terms of computer abilities and internet access. This highlights the importance of both students and teachers being prepared in order to effectively use technology. To summarise, it is crucial to develop a systematic approach to ensure readiness for the application of technology in this era of digital advancements. This approach should be in line with the objectives of modern teaching and learning methods in the 21st century.

According to Zulkarnaen (2021), Sharma found that there are certain aspects that affect how humans perceive things. One of these factors is perceptual learning, which refers to the improvement in specific skills that taught persons have compared to untrained individuals. The concepts of mental set, focusing on attention and involvement, as well as wants and motives, which are related to motivation and preferences for learning, were also found to be important. These elements contribute to the fundamental comprehension of perspectives regarding the utilisation of technology, encompassing not only students but also academic leaders. The study revealed that teacher applicants' attitudes were highly influenced by

factors such as gender, type of education, department, computer ownership, and internet connection. Perceptions of technology use, particularly in 21st-century education, are strongly connected to the level of acceptability of technology integration, which ultimately affects the quality of education in a digital learning environment.

In their study, Wah and Hashim (2021) investigated the aspirations of Malaysian ESL pre-service teachers to utilise technology in the classroom. The findings highlighted obstacles such as inadequate proficiency in pedagogical technological tools and poor understanding of digital teaching methods. Tojan Al-Sharef (2018) pointed out a lack of effective and creative ICT teaching approaches at a university in an Arab state. Obstacles in Indonesia were inadequate procurement of ICT infrastructure, absence of multimedia devices in rural regions, and the exorbitant expenses associated with ICT facilities (Ihsan et al., 2021). Hence, educators must further instruction in technology literacy to proficiently address the difficulties associated with incorporating technology into teaching practices in the 21st century.

**Methodology**

The research utilised purposive sampling to recruit participants, specifically targeting seventh-semester university students enrolled in the teaching training programme at the Faculty of Education, Islamic University of Mataram. A total of forty students participated in the completion of a questionnaire, and the programme director supplemented the findings with extra information obtained through an interview. The participants have expertise in the utilisation of technology for teaching and learning. The study utilised two instruments: a questionnaire for collecting quantitative data and an interview for gathering qualitative data. Students' preparation and impressions were evaluated using closed-ended questions on a Likert scale, while viewpoints on technology deployment were gathered from students and faculty leaders through open-ended questions. Data were gathered concurrently using distributed questionnaires and interviews, with the use of audio recording and note-taking to facilitate the interview process.

The process of quantitative data analysis includes collecting statistical sample data, resolving any bias in the responses, performing descriptive analysis, and using inferential statistics. The process of qualitative data analysis involves the systematic organisation, categorization, representation of themes, and interpretation of the data. The study provides useful insights into the attitudes of technology utilisation in education throughout the 21st century. It highlights the preparedness and obstacles encountered by students and faculty leaders when incorporating technology for the purpose of enhancing teaching and learning.

Table 1

*Coding of an interviewee*

<b>Interview Question</b>	<b>Superordinate (key words of the questions)</b>	<b>Subordinate (main points form conversation not a summary)</b>	<b>Elaboration (example from verbal to support the subordinate)</b>	<b>Occurrence (main idea transferred as keywords based on the summary of subordinate fact (s))</b>	<b>Ordering of discourse unit</b>
Do you think technology	Technology necessity	Technology become the	Technology indeed is beneficial for	Necessity Usage	19:22

<p>is a necessity in education?</p>		<p>need of all people</p>	<p>everyone and we are also as leader of Biology-Science program implementing technology. Moreover, the students are also now indicating with developing technology for instance they create interactive media, making software for learning using application, so that technology is implemented better for our learning here.</p>		
<p>Do you use technology when teaching during your training programs/teaching in the classroom?</p>	<p>Technology used for teaching</p>	<p>Absolute implementing technology on using application for teaching such as Zoom</p>	<p>Yes I do, I as leader of this program implement technology, sometimes, I use Zoom, creating virtual-video when entering the classroom. LMS (Learning Management System or called LMS) is also implemented here.</p>	<p>Active user Creativity</p>	
<p>Does your university administration encourage/support the use of technology in teaching and learning process?</p>	<p>Technology support by the university</p>	<p>Endorsement on using technology in university/faculty</p>	<p>The training is still provided, but if it is not served, in all classes, LCD has been prepared. The internet is also been set. It is sufficient within 3 access-points so they are available to teach online wherever they are.</p>	<p>Facility Internet Availability</p>	

<p>Does your university provide sufficient access to the Internet for teachers and students for using in language learning?</p>	<p>Sufficient access to the internet</p>	<p>Internet accessibility around the university</p>	<p>All this accessibility is smooth along this year, we can say it is improved day by day. The students are provided students user but for lecturers and faculty staff can use staff user so it is not mixed.</p>	<p>Management Level</p>
<p>What are your evaluations/comments regarding on the technology developed for teaching in the practical training program?</p>	<p>Evaluations or comments on teaching using technology</p>	<p>The input (suggestion) in term of teaching using technology</p>	<p>For this program, I mostly aim this to the improvement and might be more training provided gradually in managing this program.</p>	<p>Equipment Capability</p>
<p>What are possible challenges regarding the use of technology in courses?</p>	<p>Technology challenges</p>	<p>barriers on using technology</p>	<p>The challenge is sometimes on networking, it is classical. Actually the most challenge specially in this region of Lombok, West Nusa Tenggara. Sometimes the access is fast but sometimes is not. Secondly challenge is from my personal problem. If I am on my mood, it is easy for me to create material for learning from home but if it is not I just do it by</p>	<p>Accessibility Willingness</p>

			conventional method.		
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According to the table provided, the data was encoded using Nvivo 14 software to differentiate themes and subthemes that were not easily identifiable through human coding. In addition, the researcher was given manual coding as follows:

Table 2

*Manual coding of data collection provided on the combined table*

Interview Question	Main ideas from Respondent	Sub-Themes	Themes
Do you think technology is a necessity in education?	Technology indeed is necessary for all people where this implementation was developed for interactive media and software producing of learning.	Necessity	Believe
Do you use technology when teaching during your training programs/teaching in the classroom?	Technology definitely was used by the lecturers especially by the head of program in the faculty.	Active user	Behavior
Does your university administration encourage/support the use of technology in teaching and learning process?	University strongly encouraged the use of technology.	Supportiveness	Treatment choice
Does your university provide sufficient access to the Internet for teachers and students for using in language learning?	The internet access was good and upgraded every year.	Accessibility	Easiness
What are your evaluations/comments regarding on the technology developed for teaching in the practical training program?	Upcoming more programs for coaching session on using technology especially for student teacher training in university	Creativity	Development
What are possible challenges regarding the use of technology in courses?	<ul style="list-style-type: none"> <li>- The unstable accessibility of the connection</li> <li>- personality problems</li> </ul>	<ul style="list-style-type: none"> <li>- Digital service</li> <li>- Self-emotion</li> </ul>	<ul style="list-style-type: none"> <li>- Technology</li> <li>- Character</li> </ul>



**Findings:** The research involved conducting a questionnaire survey that consisted of two separate components. The entire set of questions consisted of 25 elements, which were then divided into two pieces. More precisely, there were 16 questions that focused on the participants' preparedness in using technology. These questions were based on the frameworks suggested by Al-Nofaie (2020) and Son (2010). Concurrently, the nine remaining questions explored participants' viewpoints regarding the utilisation of technology, employing approaches described by Tatlı et al. (2019) and Yordming (2017). The following table provides a comprehensive examination of preparedness and outlooks about the use of technology, as determined through statistical studies performed using SPSS.

Table 3

*Readiness and Perspectives Level of the implementation of technology among students teacher*

Dimensions	Mean	Descriptive Level	Qualitative Interpretation
Readiness	3.8	Average	Moderate manifestation of readiness and perspectives on using technology
Perspectives	3.7	Average	Moderate manifestation of readiness and perspectives on using technology
<b>Over-All Mean</b>	<b>3.7</b>	Average	Moderate manifestation of readiness and perspectives on using technology

Table 3 presents a comprehensive overview of the levels of preparedness and viewpoints among student instructors on the integration of technology. The findings suggest that student teachers had an average level of preparedness and perspectives, with a recorded readiness score of 3.8 and a perspectives score of 3.7. The average combined mean of 3.7 indicates a reasonable level of preparation and perspectives in technology implementation among student instructors.

In addition, the inquiry identified seven subthemes that were generated from the data collected during the interviews with participants. The interviewee replies revealed several subthemes, which encompassed personal beliefs and external variables that influenced their technology usage. Initially, there were seven subthemes, but certain components were consolidated, resulting in the condensation of subthemes into five categories. The refined subthemes consist of (1) necessity, (2) self-emotion, (3) active user, (4) accessibility (including supportiveness), and (5) digital service (including innovation). These subthemes summarise the main characteristics that influence the interviewee's personality and viewpoints on different aspects of technology utilisation.



Table 4

*Theme and sub-themes*

Sub-themes	Theme
Necessity	PERSONAL BELIEFS
Self-emotion	
Active user	EXTERNAL FACTORS OF TECHNOLOGY USAGE
Accessibility	
Digital service	

**Necessity:** Based on the transcribed data, the respondent, who holds a leadership position in the programme within his faculty, expressed a strong confidence in the essential nature of technology for everyone. He emphasised its crucial role, especially for himself and the university students. The programme being discussed has actively used technology into its teaching and learning activities. This includes the creation of interactive media and the development of learning software using applications.

According to the interviewee,

*"As leaders of the Biology-Science program, we are actively incorporating technology. Additionally, students are also demonstrating a proactive role in technology development, creating interactive media and crafting learning software applications. This collective effort enhances the implementation of technology for our learning endeavours."* (R1: D.U 2)

**Self-emotions:** Within the realm of obstacles to technology deployment, the presence of self-emotion arises as a noteworthy factor. Self-emotion refers to the informant's personal inclination. A recognised obstacle in the use of technology for teaching and learning is the informant's inclination to create instructional materials prior to class, which depends on their mood.

Quoting the informant verbatim,

*"The second challenge is related to my personal state. If I am in a good mood, creating learning materials from home is easy for me; otherwise, I resort to conventional methods."* (R1: D.U 20)

In today's educational environment, traditional methods are no longer the main basis for in-person interactions. However, the incorporation of technology provides instructors with a chance to vary their teaching approaches. Unfortunately, according to the informant, there is a consistent problem of reduced motivation to prepare materials before to class. Consequently, the informant, primarily in the role of a lecturer, frequently relies on traditional teaching techniques. Therefore, technology is mostly used to improve teaching circumstances, for example, by using a PowerPoint application to help students better understand the provided materials.

**Active User:** In the discussed context, the word "active user" refers to an individual who actively interacts with and primarily utilises technology for educational reasons. This category highlights the informant's active use of technical tools. Furthermore, it is worth mentioning that the regional government has implemented measures to promote the incorporation of technology, particularly in light of the difficulties presented by the Covid-19 epidemic. An exemplary endeavour in this context is the execution of the Learning Management System (LMS) programme.

According to the informant, the LMS application is used not just by instructors and stakeholders within the university, but also by educational professionals across the country. The respondent clearly and unequivocally claimed,

*"Yes, I, as the leader of this program, actively implement technology. At times, I utilize Zoom, creating virtual videos when conducting classroom sessions. Moreover, the Learning Management System (LMS) is also seamlessly integrated into our instructional practices."* (R1: D.U 6)

**Accessibility:** Accessibility is a crucial factor that is closely connected to the integration of technology. Both educators and learners inside the university setting require an internet connection to successfully carry out their jobs. This also applies to stakeholders who perform their responsibilities using online methods.

The informant expressed appreciation for the progress achieved throughout the year, highlighting the initial lack of familiarity with new technology within the academic community. Nevertheless, the assistance offered by the younger team with a focus on technology played a crucial role in overcoming this initial difficulty in acquiring new skills. The extensive utilisation of notebooks, laptops, and high-speed internet connection further enhanced the incorporation of technology. The allocation of accounts between students and instructor staff, with each group having separate accounts for network operations, ensured a smooth utilisation process without any conflicts. As per the informant, these accessibility measures operated efficiently throughout the year.

*"Alhamdulillah along this year, it has been improved. At first, it is a new thing, new technology, most of us did not really master about it, but by the technician who mentioned as younger team above are really helpful. It is also because everyone utilizes notebook, laptop and fast internet access here. Additionally, the account is provided in different part between students and teacher staff. It is provided two different accounts to run this network so the utilization does not collide. All this accessibility is smooth along this year."* (R1: D.U 14)

Although there have been some significant advancements, it is important to recognise the limitations that still exist, specifically in relation to networking problems. The informant emphasised sporadic fluctuations in internet speed, which were described as a notable difficulty.:

*"The challenge is sometimes with networking, it is a classical issue. Particularly in this region of Lombok, West Nusa Tenggara. Sometimes the access is fast, but at other times, it is not."* (R1: D.U 20)

This highlights the subtle and complex nature of accessibility issues in the wider context of difficulties encountered in teaching and learning.

**Digital Service:** Upon attaining national standard status in Lombok, the institution experienced a concurrent improvement in all areas of support, with a special focus on the supply of cutting-edge technology. This enhancement encompassed not only instructors and university stakeholders, but also all students and individuals involved in activities within the university.

The informant commended the university's leadership for their proactive attitude, specifically highlighting their rapid feedback and resolutions to reported difficulties. The improved efficiency was credited to the enhanced accessibility provided by three access points, a significant improvement from the previous situation where only one access point was

available, leading to limitations in connectivity. The informant emphasised the convenient access to resources from any place, particularly within the Biology programme.

*“Indeed, it is very encouraged. Alhamdulillah the head of this university is now proactive, when we have some report, the feedback is really fast. It means it will be solved quickly. In the past, it took time, because it was only 1 access-point so the connection was being conquest. But now, it is available to access anything wherever we are with 3 access-points especially in this Biology program.”* (R1: D.U 12)

The explanation above clearly emphasises the strong backing from university stakeholders for all educational participants in using technology, especially in the context of teaching and learning processes.

### **Discussion**

To effectively integrate technology into the modern educational environment, it is essential to skillfully employ a range of digital tools. According to Arianti, Wirasmita, & Rasyid Hardi (2020), students have a wide range of application options available to them that suit to different learning styles and topic requirements. Therefore, it is crucial for educators to skillfully navigate the digital domain in order to fully use the advantages of technology for educational purposes. The results of the questionnaire survey indicated that respondents had a modest level of readiness (3.8) and perceptions (3.7) regarding the implementation of technology. A marginal difference of 0.1 points was observed between readiness and perceptions, as inferred from statistical analysis conducted using SPSS. The divergence in viewpoints offers a detailed viewpoint on how technology is being used in this academic department. This understanding is based on the information gathered from the questionnaire survey, which explores the preparedness and opinions of the faculty members.

Participants emphasised that network concerns were the main and recurring challenge in using technology at the university located in a rural area. The volatility of accessibility resulting from network issues resulted in buffering during educational activities that depend on technology. In addition, difficulties in facilitating the session were observed, specifically when there were issues with device connectivity. For example, a malfunctioning LCD cable prevented the smooth delivery of educational materials. The recognition of personal obstacles, such as a decline in motivation to prepare materials prior to class, led to the lack of suitable resources for effective teaching and learning.

According to the interviewee's personal experience, despite having prepared teaching materials, network issues caused considerable delays, highlighting the crucial importance of a dependable network in technology-based teaching and learning. It is important to emphasise that these issues were mostly linked to the rural characteristics of the region rather than any shortcomings in the facilitation offered by stakeholders. Faculty leaders continuously made efforts to address and resolve concerns, showing a continuous commitment to improving the quality of technology-enabled teaching and learning processes in the faculty.

### **Limitation and Recommendation**

The main aim of this research is to provide a comparative examination of student instructors' preparedness and perspectives on incorporating educational technology into their teaching and learning methods across different programmes. Furthermore, the study seeks to uncover the obstacles and difficulties that faculty leaders see when incorporating educational

technology into their teaching and learning activities. The objectives are influenced by the knowledge gained from their hands-on experiences in teaching and learning activities within the university environment.

In order to strengthen the reliability of the results, it is crucial to include a wide range of participants from different programmes. A significant number of participants were recruited for the questionnaire survey to guarantee a full representation and a considerable interchange of ideas and information. The study's importance lies in its contribution to the comprehension of preparedness and obstacles in the adoption of technology, specifically in a rural setting like Lombok. The results of this study provide useful understanding of the intricacies of using technology for teaching and learning in rural locations. This gives readers a more detailed viewpoint on the difficulties and possibilities of integrating technology in these educational environments.

### Conclusion

This study provides a clear understanding of the readiness and obstacles related to the incorporation of technology. The results have enabled the creation of a diagram based on the framework suggested by Kaur, Singh, Ong, & Tunku (2020). This diagram illustrates the various aspects of learning in the modern era, categorising them as skills relevant to the twenty-first century, particularly emphasising proficiency in technology. One way for learners to meet the requirements of the twenty-first century is by improving their skills in technological literacy. The visual representation of this mental dimension is illustrated in the following figure:

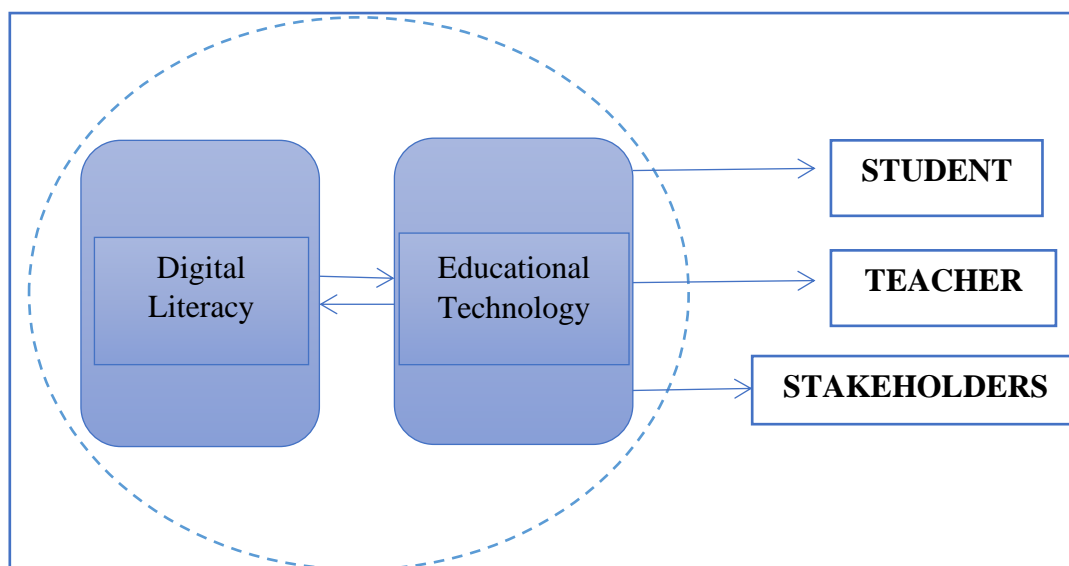


Figure 1: Dimension of Technology Implementation

Based on the provided conceptual framework, it can be inferred that educational technology is closely linked to digital literacy. These connections primarily involve students, teachers, and stakeholders who are involved in the use of technology. The investigation clearly demonstrates that learners' competence and perspectives are crucial in driving the use of educational technology, as revealed by the findings on readiness and barriers to technology implementation. This ultimately contributes to achieving the criteria for 21st-century education. The concept of digital literacy, which is highlighted in this study, is closely

connected to the experiences of both students and faculty leaders in effectively using this technological tool.

To tackle the problems and obstacles, academic authorities, and even the government, have made efforts to solve these issues by placing emphasis on improving technology literacy abilities. This research argues that digital literacy is clearly supported by the observable outcomes related to the preparedness and obstacles in the use of technology among student teachers at this university.

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